

# CLIMATE SERVICES FOR ENERGY

**Nube Gonzalez-Reviriego (IC3)**

Francisco Doblas-Reyes (IC3/BSC/ICREA)

Melanie Davis (IC3), Verónica Torralba-Fernandez (IC3), Aida Pinto-Biescas (IC3)

EUPORIAS



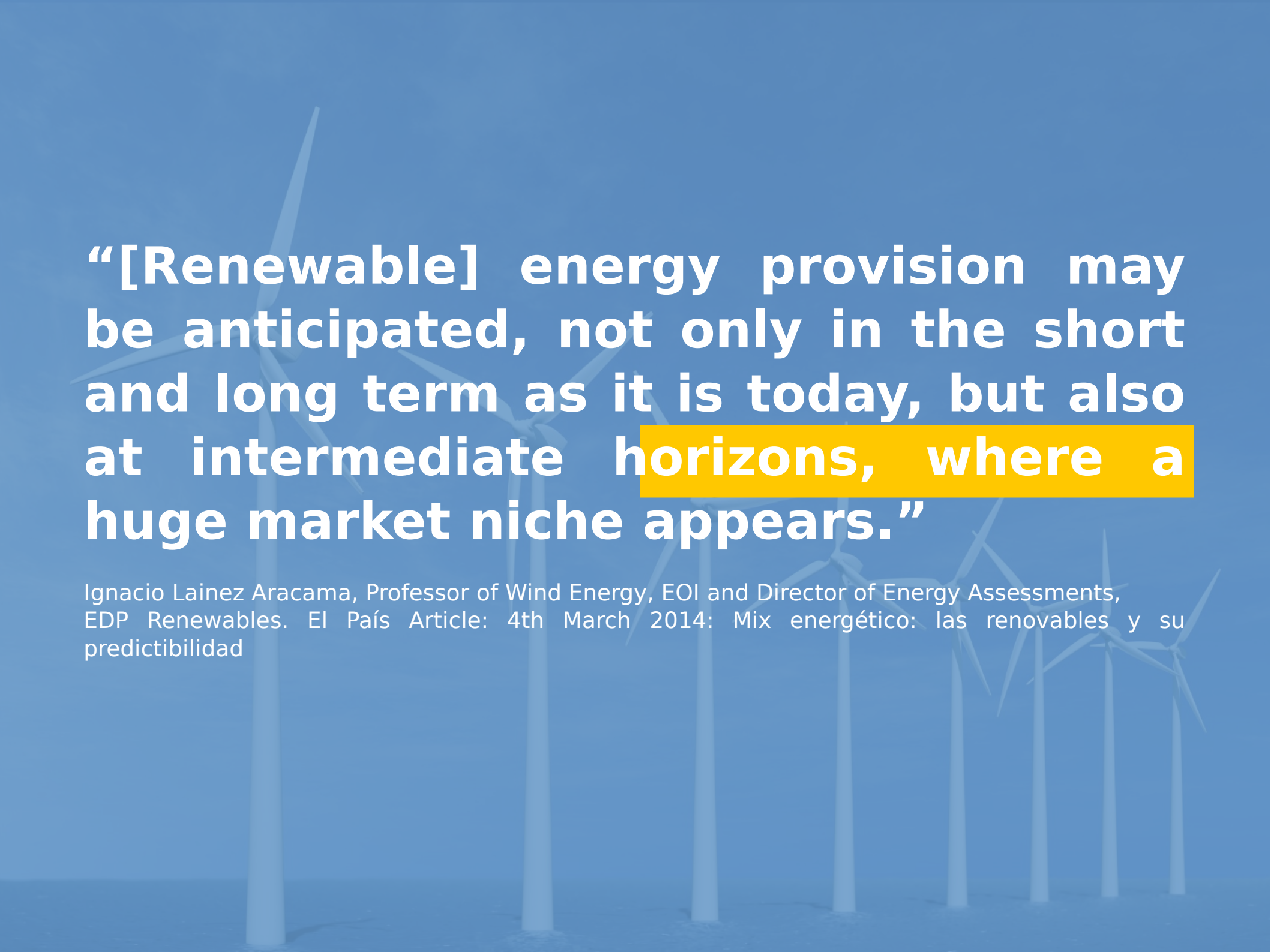
# OUTLINE:

An orange arrow pointing to the right, highlighting the first item in the outline.

**1. OVERVIEW OF CLIMATE SERVICES FOR ENERGY**

**2. CLIMATE SERVICES PROJECTS**



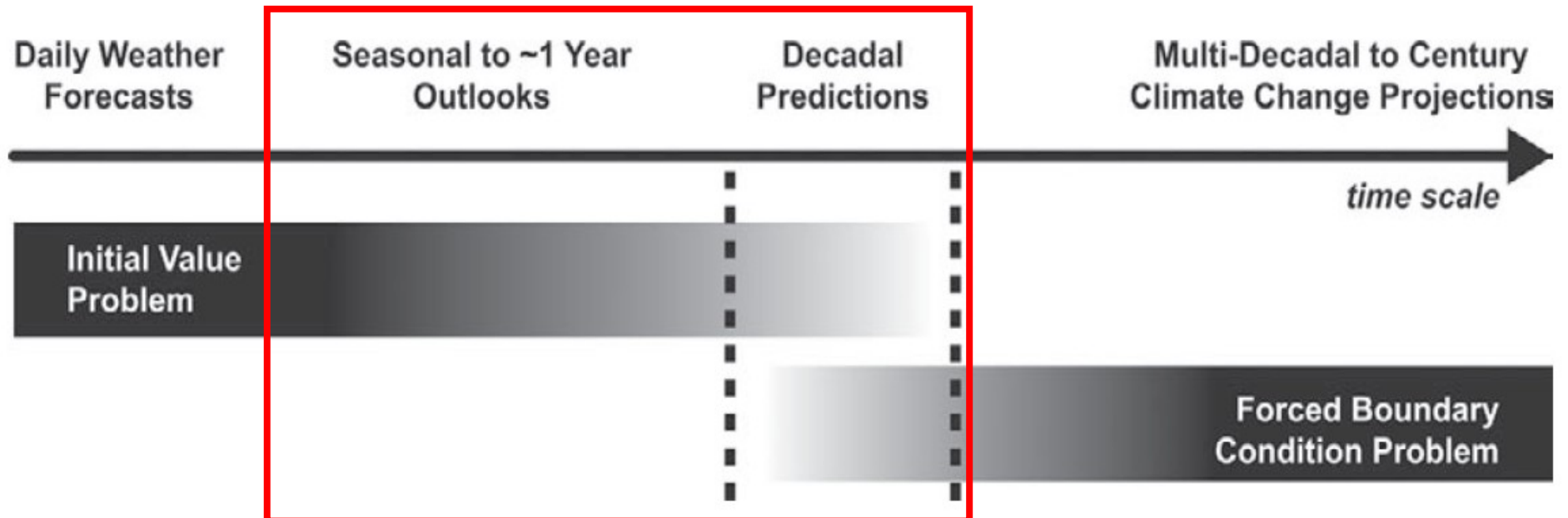


**“[Renewable] energy provision may be anticipated, not only in the short and long term as it is today, but also at intermediate horizons, where a huge market niche appears.”**

Ignacio Lainez Aracama, Professor of Wind Energy, EOI and Director of Energy Assessments, EDP Renewables. El País Article: 4th March 2014: Mix energético: las renovables y su predictibilidad

## Time Scale Horizons

- Initial-value problems (weather forecasting) to forced boundary condition problem (climate projections)
- **Climate forecasts** (sub-seasonal, seasonal and decadal) in the middle



## WHY Climate Services?

**Anticipate and Identify Vulnerabilities and Risks**

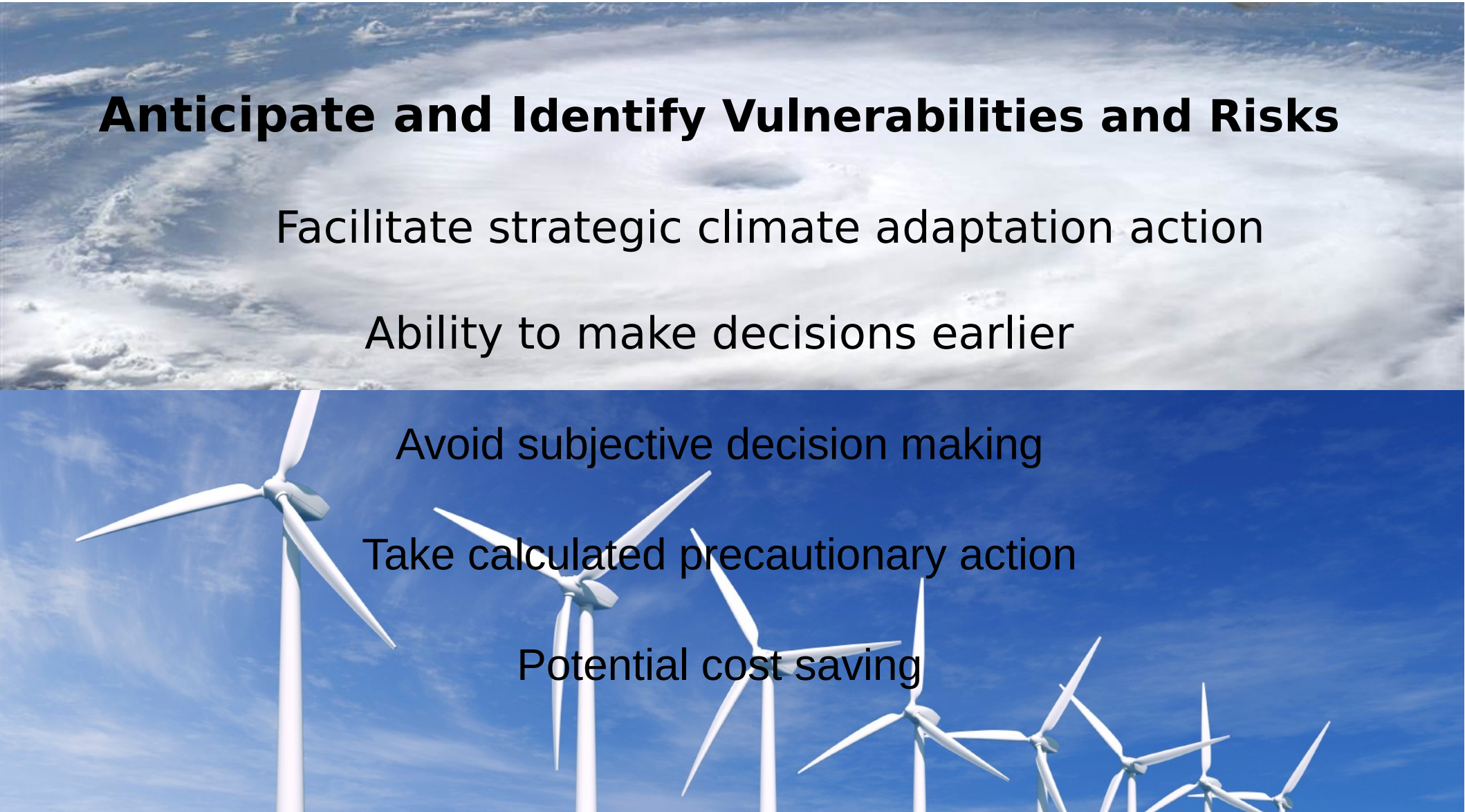
Facilitate strategic climate adaptation action

Ability to make decisions earlier

Avoid subjective decision making

Take calculated precautionary action

Potential cost saving







# Pre-Constuction Decisions: Annual to Decadal Timescales

**Wind farm planners:** Site selection

**Wind farm investors:** Evaluate return on investments

**Policy makers:** Understand changes to energy mix

# Post-Construction Decisions: Monthly to Seasonal Timescales

**Energy producers:** Resource management strategies

**Energy traders:** Resource effects on markets

**Wind farm operators:** Planning for maintenance works

**Wind farm investors:** Optimise return on investments



# **OUTLINE:**

**1. OVERVIEW OF CLIMATE SERVICES FOR ENERGY**

 **2. CLIMATE SERVICES PROJECTS**



# **SPECS: Seasonal-to-decadadal climate Prediction for the improvement of European Climate Services**

**IC3 role:** Project coordinator

**Call:** FP7 Environment and Climate

**Description:** Deliver a new generation of European climate forecast systems, with improved forecast quality and efficient regionalisation tools.

**Link to energy:** IC3 and Vortex represent the renewable energy service provider and user group in the project.

**Total budget:** 11,989,174€

**Timeframe:** 2012-2016

# EUPORIAS: European Provision Of Regional Impact Assessment on a Seasonal-to-decadal timescale

**IC3 role:** Partner, WP leader and energy case study representative

**Call:** FP7 Environment and Climate

**Description:** Develop new technologies to exploit emerging capabilities from climate research. Engage with users to develop useful & usable tools.

**Link to energy:** IC3 and EDF/Vortex represent the renewable energy service provider and user groups to develop semi-operational prototype for European wind forecasts over seasonal timescales.

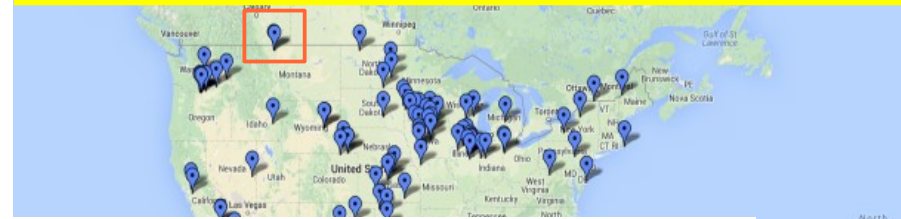
**Total budget:** 12,962,917€

**Timeframe:** 2012-2016

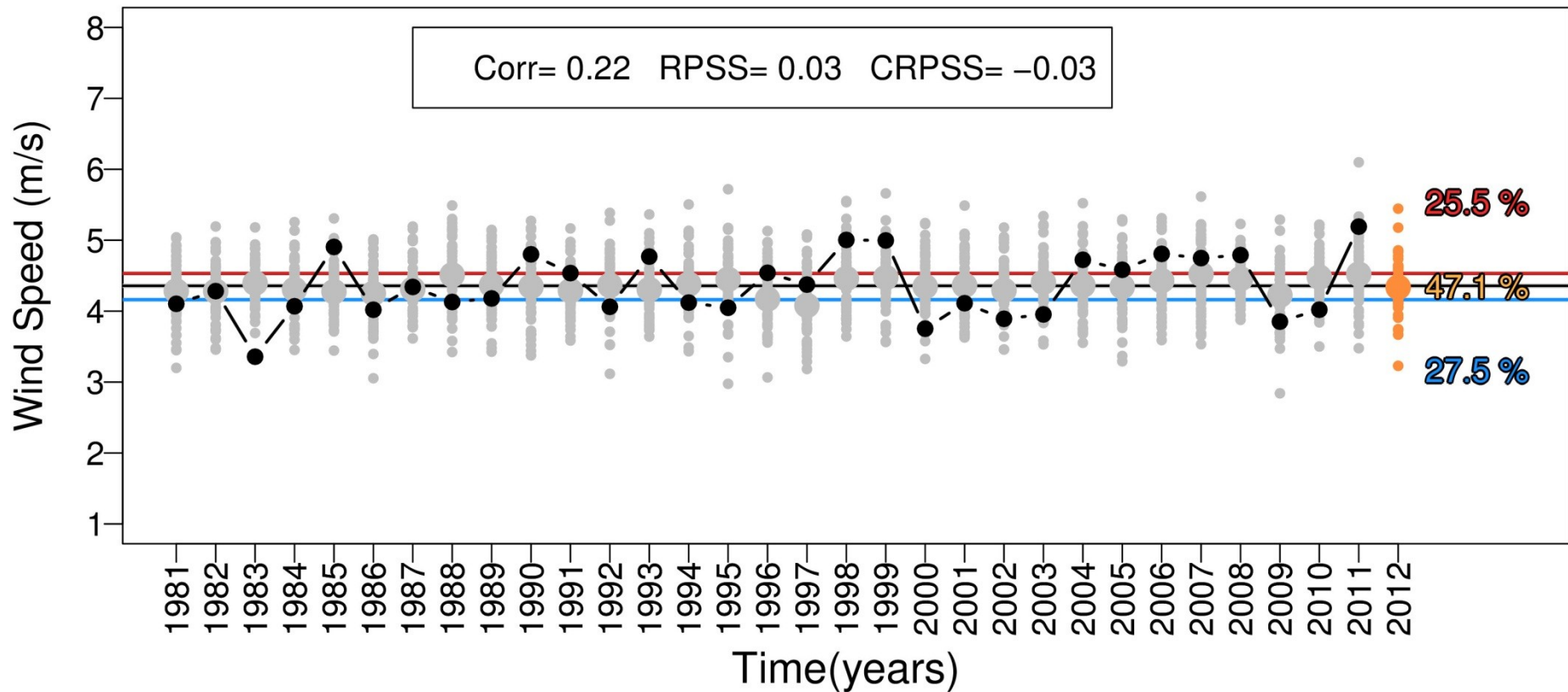


# Wind Speed Forecast

Climate model: ECMWF S4  
10m wind speed “observations”: ERA-Interim  
Winter season forecast: 1 month lead time

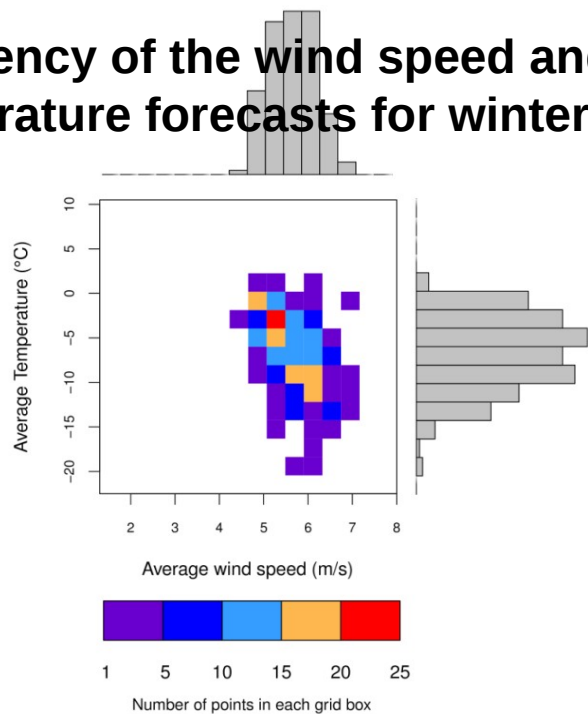


## Simple bias correction

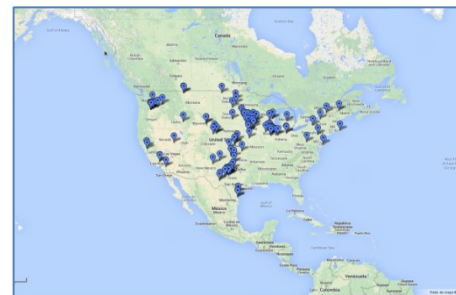
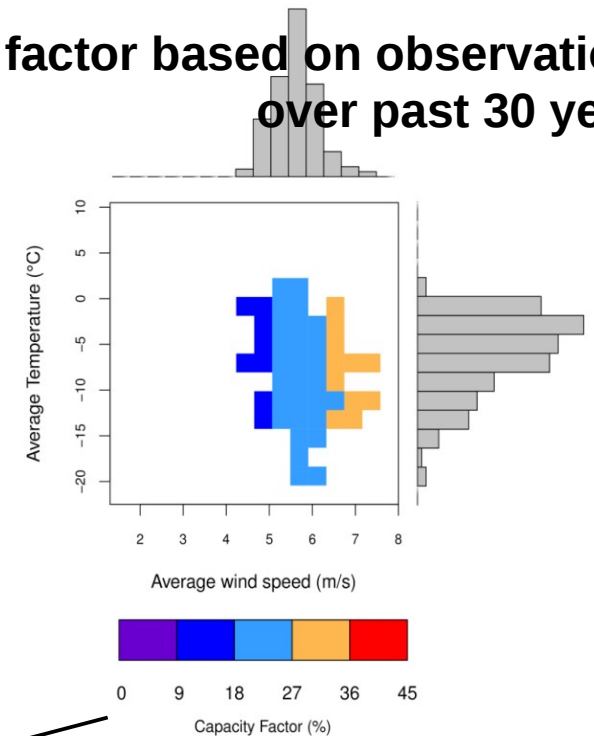


# Translating Wind Forecasts into Power Capacity

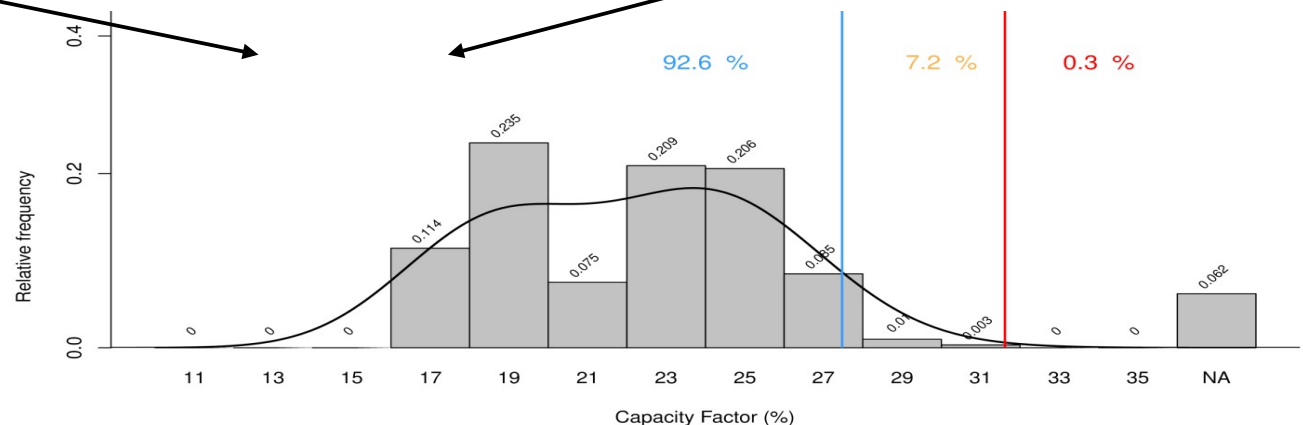
Frequency of the wind speed and temperature forecasts for winter season 2012



Capacity factor based on observations over past 30 years

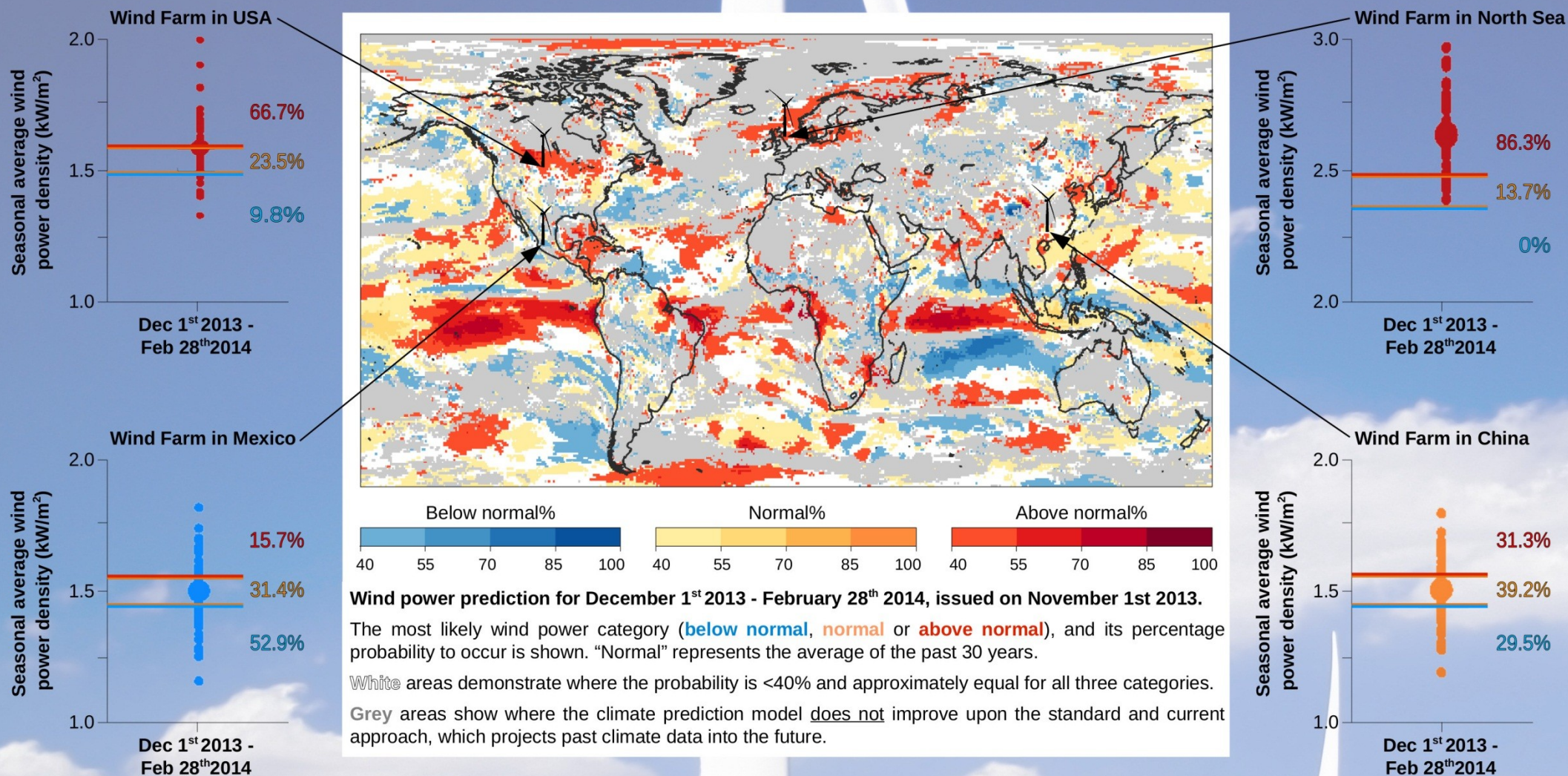


Forecast of capacity factor for winter season 2012





## Illustrative examples of seasonal wind power predictions





# RESILIENCE: Strengthening the European Energy Network with Climate Services

**IC3 role:** Project leader

**Call:** National – Spanish Ministry of Industry

**Description:** Strengthen the efficiency and security of the European energy network using the state-of-the-art from subseasonal-to-seasonal climate predictions of wind power supply and temperature-related demand, developed in co-production with end users.

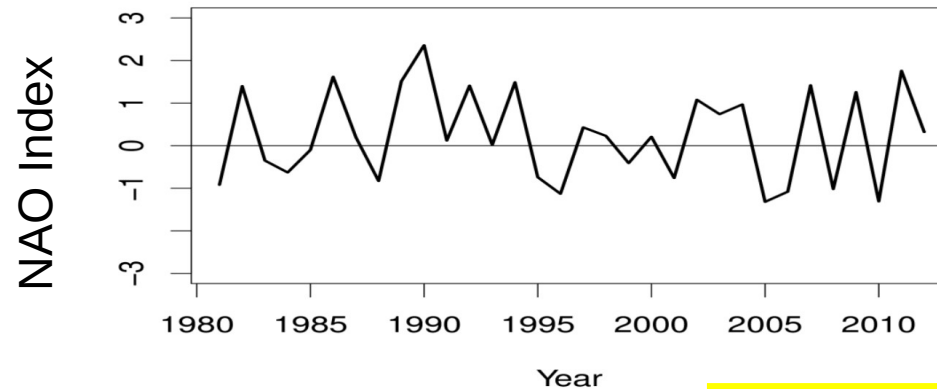
**Link to energy:** Special focus on the Iberian Peninsula and the North Sea region where wind power supply has significant impact.

**Total budget:** 224,000€

**Timeframe:** 2014-2016

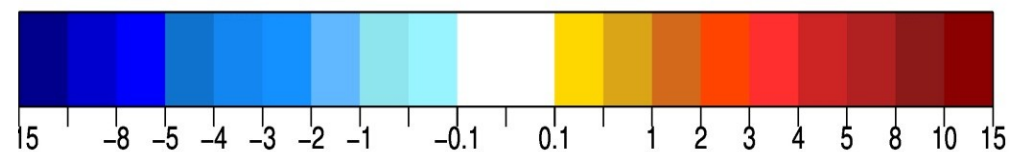
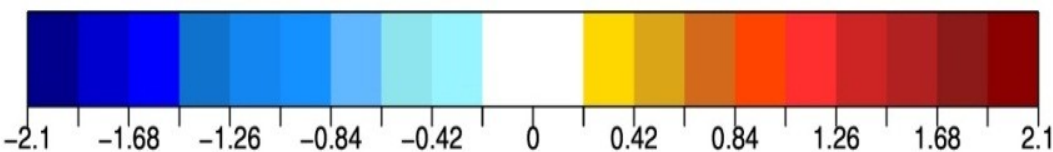
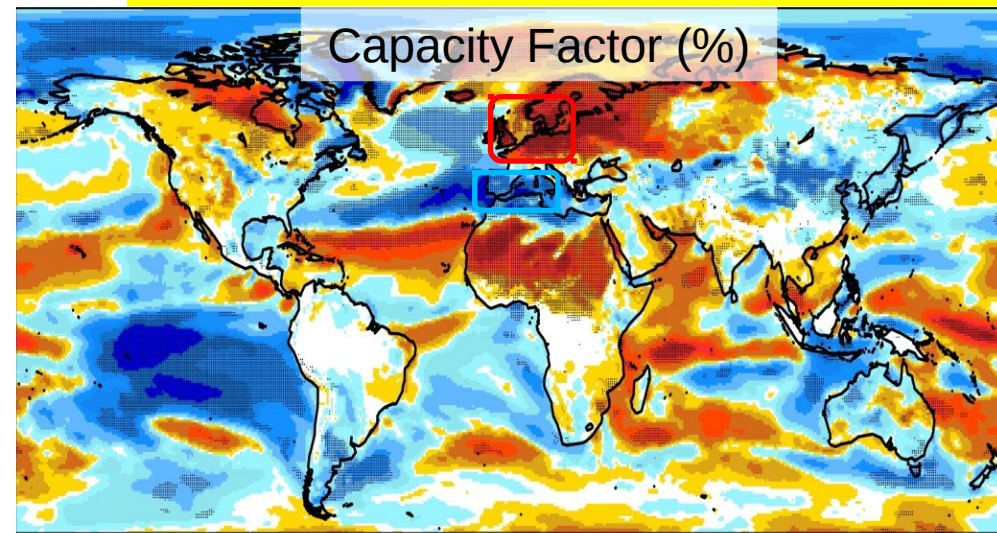
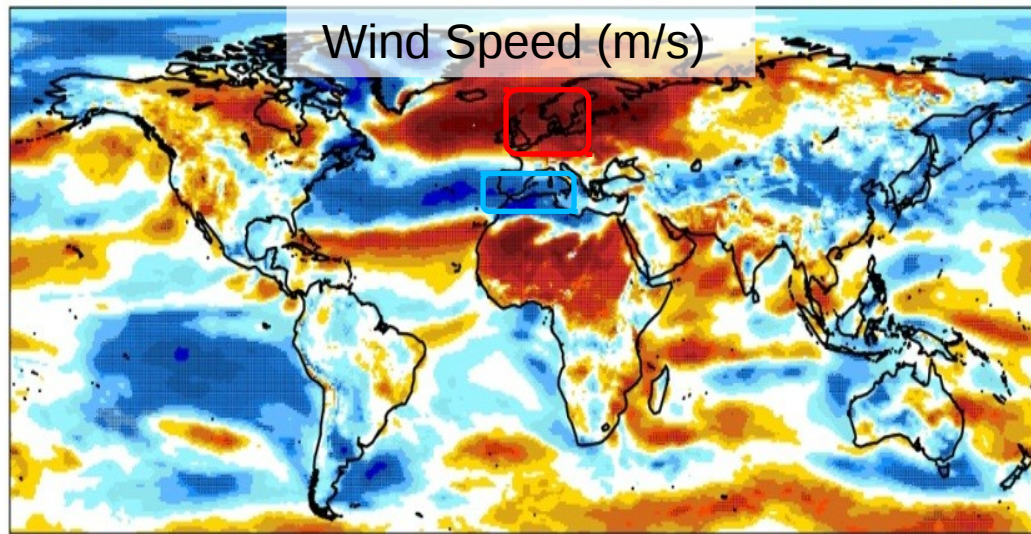


# Impact of NAO on Wind Speed and Capacity Factor



**Differences with NAO + and NAO - conditions**

10m wind speed “observations”: ERA-Interim  
Boreal winter season period 1981-2012





## FUTURE WORK:

### **NEWA: New European Wind Atlas**

**Description:** New EU wind climate database to reduce the uncertainty of wind project discrepancies between calculated and actual production and operating conditions.

### **PRIMAVERA: PRocess-based climate sIMulation: AdVances in high-resolution modelling and European climate Risk Assessment**

**Description:** To develop a new generation of advanced and well-evaluated high-resolution global climate models, capable of simulating and predicting regional climate with unprecedented fidelity, for the benefit of governments, business and society in general.

### **IMPRESX: IMproving PRedictions and management of hydrological EXtremes**

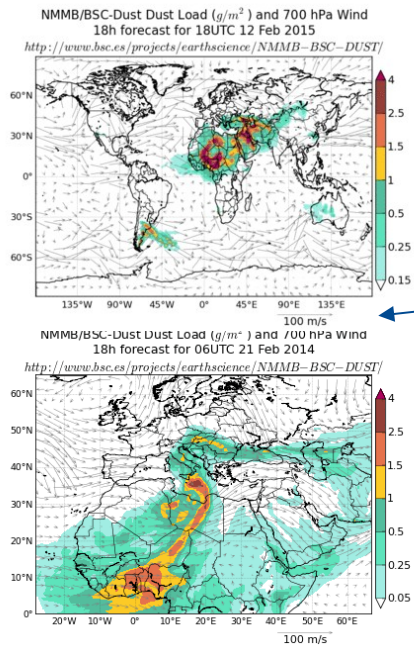
**Description:** To improve forecast skill of meteorological and hydrological extremes in Europe and their impacts, by applying dynamic model ensembles, process studies, new data assimilation techniques and high resolution modeling.



# SHORT TERM FORECAST SERVICES FOR THE ENERGY SECTOR.

# Mineral dust modelling for solar energy management

BSC has developed in collaboration with NCEP the NMMB/BSC-Dust model

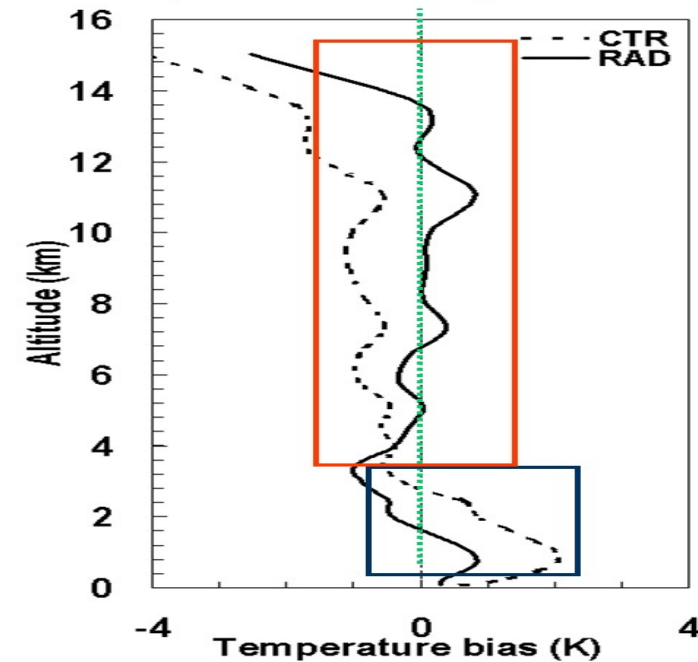


Forecast and  
diagnostic mode

Regional and  
global scales

On-line  
feedbacks:  
Dust-radiation  
interaction

BIAS 13 April 2002 at 00UTC (24h forecast)



## Services: Solar energy management

- Forecasts system to prevent energy loss and improve the management of solar power plants
- Geographical information to decide the location of future solar power plants

